DID VERTIGO KILL AMERICA'S FORGOTTEN ASTRONAUT?

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On November 15, 1967, U.S. Air Force test pilot Major Michael J. Adams was killed while flying the X-15 rocket-propelled research vehicle in a parabolic spaceflight profile. This flight was part of a joint effort with NASA. An electrical short in one of the experiments aboard the vehicle caused electrical transients, resulting in excessive workload by the pilot. At altitude Major Adams inappropriately initiated a flat spin that led to a series of unusual aircraft attitudes upon atmospheric re-entry, ultimately causing structural failure of the airframe. Major Adams was known to experience vertigo (i.e. spatial disorientation) while flying the X-15, but all X-15 pilots most likely experienced vertigo (i.e. somatogravic, or "Pitch-Up", illusion) as a normal physiologic response to the accelerative forces involved. Major Adams probably experienced vertigo to a greater degree than did others, since prior aeromedical testing for astronaut selection at Brooks AFB revealed that he had an unusually high degree of labyrinthine sensitivity. Subsequent analysis reveals that after engine burnout, and through the zenith of the flight profile, he likely experienced the oculoagravic ("Elevator") illusion. Nonetheless, painstaking investigation after the mishap revealed that spatial disorientation (Type II, Recognized) was NOT the cause, but rather, a contributing factor. The cause was in fact the misinterpretation of a dual-use flight instrument (i.e. Loss of Mode Awareness), resulting in confusion between yaw and roll indications, with subsequent flight control input that was inappropriate. Because of the altitude achieved on this flight, Major Adams was awarded Astronaut wings posthumously. Understanding the potential for spatial disorientation—particularly the oculoagravic illusion—associated with parabolic spaceflight profiles, and understanding the importance of maintaining mode awareness in the context of automated cockpit design, are two lessons that have direct application to the commercial space industry today.

Learning Objectives: 1) Know the definition of oculoagravic illusion, and understand how it relates to the somatogravic and oculogravic illusions; 2) Understand the concept of mode awareness, and the importance of discriminability in the design of multi-use displays.

Question: The experience of the instrument panel seemingly moving downward in the visual field after the cessation of prolonged upward (linear) acceleration, is known as the:

1) Somatogravic Illusion
2) Somatogyral Illusion
3) Oculogravic Illusion
4) Oculoagravic Illusion
5) Oculogyral Illsuioon

Answer: 4) Oculoagravic Illusion